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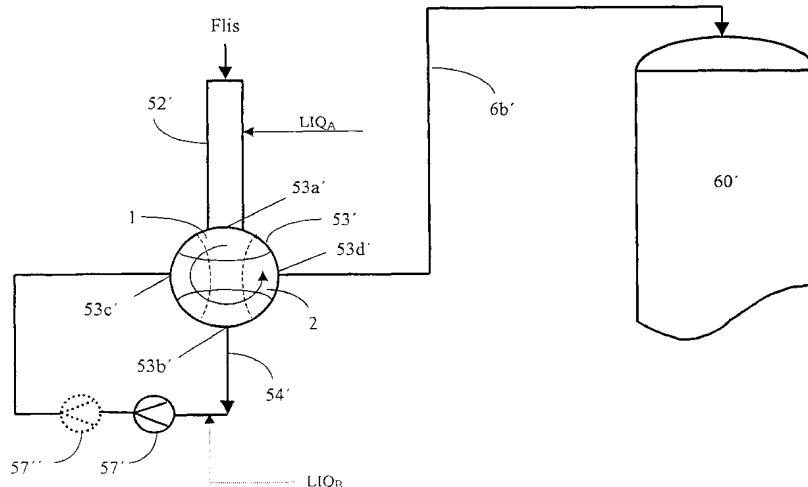
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(54) Title: METHOD FOR THE FEED OF CELLULOSE CHIPS DURING THE CONTINUOUS COOKING OF CELLULOSE



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(57) Abstract: A method for feeding a chips slurry from a low- to a high-pressure system during the continuous cooking of chemical cellulose pulp. The feed takes place through a sludge feeder (53') between these systems. The sludge feeder is provided with a rotor with through-pockets (1, 2) that are alternately connected with the low- or the high-pressure system. A recirculation line (54') comprising a high-pressure pump (57') extends from the first outlet (53b') of the sludge feeder to the second inlet (53c') of the sludge feeder for transport of the fluid that has been expelled from the pockets of the sludge feeder when these are located in their first position. The fluid that according to the method expels the chips mixture from the pockets of the sludge feeder in their second position is essentially exclusively constituted by the fluid that has been expelled from the pockets in their first position.

METHOD FOR THE FEED OF CELLULOSE CHIPS DURING THE CONTINUOUS COOKING OF CELLULOSE

TECHNICAL AREA

The invention concerns a method for the feed of cellulose chips during the continuous
5 cooking of cellulose according to the introduction to claim 1.

THE PRIOR ART

When cooking cellulose chips in continuous digesters, the chips are transported from a feed system at atmospheric pressure, or a pressure slightly over atmospheric pressure, by what is known as a "transfer flow" to an impregnation vessel or a digester at a
10 considerably higher pressure. Transport in the transfer flow is made possible by the chips being combined with a transport fluid, preferably a process fluid, to form a slurry; the transport fluid being subsequently separated from the chips in separation equipment, normally denoted the "top separator", when it has reached the impregnation vessel or the digester. The transport fluid is returned to the feed system through a return line. The
15 transfer flow has for many years comprised a special type of sluice feeder, known as a high-pressure feeder, that will hereafter be denoted the "HP feeder". This feeder has been specially designed such that it can resist the large differences in pressure that are present between the two systems. The HP feeder is provided with a rotor having symmetrical through-pockets that come into contact during rotation, alternately with the
20 low-pressure system and the high-pressure system, without allowing any communication between these two systems. The chips can in this way be taken from a system at zero pressure or at a low pressure, typically 0-4 bar (abs), and they can be fed via the HP feeder into a system at a considerably higher pressure, typically 7-20 bar
(abs).

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The method currently used for filling the pocket in the HP feeder, used for example in US 6,120,646, is to establish a large flow of fluid through what is known as a "chute flow" (flow 4' in Fig. 2, and flow 4" in Fig. 3 in patent US 6,120,646) such that the transport fluid in this way carries chips with it into the pocket. There is thus a certain
30 amount of the transport fluid in this chute flow that passes directly through the pocket during the filling phase. Chips are expelled from the pocket by the same principle for

onwards transport up to the impregnation vessel or the digester in what is known as a transfer flow, something that in principle means that the transfer flow carries with it a larger quantity of transport fluid than is actually desirable. It is therefore necessary to withdraw (as a minimum amount) the excess transport fluid from the chips before they 5 are fed down into the treatment vessel. The transport fluid that is withdrawn is returned to the HP feeder (flow 5 in Fig. 2 and Fig. 3 in patent US 6,120,646) in order to expel chips again from a filled pocket in the HP feeder.

Very high liquid/wood ratios, L/W ratios, are created through both of these flows, and 10 this has long been regarded as necessary in order to transport the chips. It has also been believed that the HP feeder requires these high fluid flows in order to function satisfactorily with respect to, among other aspects, the degree of filling and the expulsion of the chips from the pocket at the high-pressure position, particularly when it is required to increase the production capacity and when the rotation of the HP feeder 15 has consequently been increased. This way of thinking has resulted in it being normal for many years to establish a L/W ratio in the chute flow of between 5-10 tonnes per tonne, and a ratio as high as 15-25 tonnes/tonne in the transport flow. Thus, these flows transport very high quantities of fluid, something that has resulted in pumps, pipes, valves and regulators for these flows becoming major expenses with respect to both 20 investment and operation. This means that there are particularly strong reasons for discovering a method for transporting the chips from the input system to the digester system without these fluid flows, and this is the primary aim of the invention.

Surprisingly, it has now become clear that it is possible with a method according to the 25 present invention to fill and empty the HP feeder without the large fluid flows that have previously been considered necessary. Experiments have shown that only a minimum of fluid is required for the purpose, namely: as much fluid that naturally fills the spaces that exist between the chips in the column of chips in the chip chute. In order to reduce the friction between the column of chips and the wall of the chute, however, somewhat 30 more fluid than this minimum is used, typically 10% more than the smallest amount. This corresponds to a L/W ratio in the range 5-10:1.

Most of the cooking methods that have been developed in recent years have been directed towards establishing high L/W ratios both during the impregnation phase and during the cooking phase, typically approaching 5-10, which is to be compared with the ratios of 2.5-4 required according to older cooking methods. When using a method 5 according to the present invention, only a minimum of fluid is used to transport the chips in the transfer line, and thus all the fluid can be allowed to accompany the chips to the subsequent treatment vessel. Thus, a return line for transport fluid is not necessary, nor are the pumps, valves and instruments associated with such a line, something that makes the input system a great deal cheaper. It will be clear to one 10 skilled in the arts that it is possible to avoid the separation equipment at the top of the treatment vessel if this is desirable from the point of view of the process, something that ensures that the investment cost for a digester with an input system according to this invention is even further reduced.

15 **THE PURPOSE AND AIM OF THE INVENTION**

The aim of the invention is to offer a method during the transport of a chips mixture from an input system that works at a first low pressure and that comprises an HP feeder for transfer of the chips mixture through a sluice to a treatment vessel in a digester system for the continuous cooking of chemical cellulose pulp that functions at a second, 20 higher pressure and where the input system does not comprise a chute flow nor does it comprise a return line in the transport flow. This is achieved using a method according to the characteristic part of claim 1.

A further aim is to make an input system possible where a top separator at the top of the 25 impregnation vessel or the digester is not necessary.

BRIEF DESCRIPTION OF THE INVENTION

The method according to the invention can be applied in both single-vessel and in double-vessel digester systems of digesters of both steam-phase and hydraulic type. In one preferred embodiment the method is applied such that the fluid that feeds the chips 30 mixture from the pockets of the HP feeder when these pockets are positioned in the emptying position in a second position is constituted by the fluid that has been expelled from the pockets of the HP feeder when these are positioned in a filling position in a

first position. The chips mixture is transported from the HP feeder to a treatment vessel via a transfer line and the method is characterised in that the L/W ratio in the chips mixture is essentially maintained at the same level in this transfer line as the level in the position immediately before the feed into the HP feeder. The method does not require 5 any extra addition of transport fluid to the HP feeder in order to extract the chips, which ensures that the return line for transport fluid from separation equipment at the top of the treatment vessel is not necessary.

According to one alternative embodiment, the method is applied to processes with high 10 L/W ratios during the impregnation or the cooking, also making separation equipment at the top of the treatment vessel unnecessary.

The HP feeder can be located in an input system in order to promote a chips mixture from a chip chute with a preceding steaming vessel, which can be constituted by an 15 impregnation vessel or by a digester. The HP feeder can also be located at a position between two treatment vessels, which can be constituted by a first impregnation vessel, at atmospheric pressure, and a second, pressurised, digester.

Further characteristics and aspects of the invention, together with its advantages, are 20 made clear by the accompanying claims and by the following detailed description of some embodiments.

DETAILED DESCRIPTION OF THE INVENTION

Description of the drawings:

25 Figure 1 shows schematically a conventional feed system with an HP feeder together with a chip chute and a transfer flow.

Figs. 2a, 2b show schematically a feed system according to a technology developed later comprising both a chute flow and a transfer flow with return line (according to US 6,120,646).

30 Figure 3 shows in detail an arrangement around the HP feeder (according to US 6,120,646).

Figure 4 shows one preferred embodiment of a feed system according to the

invention.

Figure 5 shows an alternative embodiment according to the invention in which the method is applied for an HP feeder located between two treatment vessels.

5 Figure 1 shows schematically a feed system according to the prior art with an HP feeder 33 together with a chips flow 34 and a transfer flow (6a, 45). The transfer flow is constituted by a transfer line 6a for transport of chips that have been formed into a slurry with a transport fluid, and a return line 45 for the transport fluid. The transfer line 6a connects at its upper end to a top separator 47 at the top of a treatment vessel 48 10 where the excess transport fluid is separated from the chips and subsequently returned to the HP feeder 33 through the return line 45. The top separator 47 is here symbolised by a downwardly fed version in a hydraulic digester, but it can just as well be constituted by an upwardly fed top separator in a steam/fluid phase digester, a strainer arrangement at the top of a hydraulically filled treatment vessel or any other separation 15 equipment arranged in the transfer line or at the upper section of the treatment vessel.

Two examples of feed systems are shown in Figures 2a and 2b comprising both a chute flow and a transfer flow with return line according to US 6,120,646. These examples can be said to constitute examples of feed systems according to the prior art developed 20 at a later stage. The reference numerals in each drawing are specified according to the following order (Figure 2a, Figure 2b). The chute flow in Figure 2a is constituted by the line 34 and the associated pump 37, while the chute flow in Figure 2b is equivalent to the line 69. One of the characteristics of the present patent is the omission of a strainer, known as a "bottom strainer", between the high-pressure feeder and the line of 25 the chute flow (34, 69) in what can be said to constitute the bottom of the pocket of the HP feeder, when this is located at its filling position at its first position. The return lines (45, 55) in the transfer flow from the treatment vessel (48, 60) are also seen in the drawings. The L/W ratio in the chip chute (32, 52) can be controlled by adjusting the addition of fluid in the chute flow (34, 69). In order to ensure a secure feed of chips in 30 the chip chute (32, 52) the L/W ratio normally lies in the interval from 5-10:1. A degree of filling in the chip chute (32, 52) of 80-85% according to what is specified in US 6,120,646 is equivalent to an L/W ratio of 5.8-6.3:1 when the density of chips is 145

kg/m³, and a L/W ratio of 4.2-4.6:1 when the density of the chips is 200 kg/m³. The transport fluid that is added at the second inlet (33c, 53c) of the HP feeder in order to expel the chips from the pocket arrives through the return line (45, 55) from the treatment vessel (48, 60) when the pocket is in its second position, that is, when the 5 chip pocket opens onto the high-pressure system. The transport fluid is used in order to make transport of the chips to the top of the treatment vessel (48, 60) possible, and very high L/W ratios, typically between 15-20:1 have traditionally been locally established in the transfer line (6a, 6b) between the high-pressure feeder (33, 53) and the top separator (not shown in the drawings) by addition of this transport fluid. A quantity of 10 transport fluid is subsequently withdrawn at the top separator such that the L/W ratio becomes between 2.5-5 when the chips are fed downwards into the treatment vessel. The embodiment according to Figure 2b is the one that lies closest to the present invention, since the recirculation line 54 from the first outlet 53b of the HP feeder is connected with the second inlet 53c of the HP feeder, although this is connected via the 15 return line 55 in the transfer flow.

An arrangement equivalent to Figure 2a around the HP feeder 33 is shown in more detail in Figure 3 with the chute flow 34 and the transfer flow (6a, 45) together with some of the pumps (37, 42, 46), valves (HS) and instruments (SF, SC, LC, FC, FI, FF) 20 that are required to control this arrangement.

Figure 4 shows one preferred embodiment of a feed system according to the invention. Against the background of the prior art, where an arrangement according to Figure 2b of US 6,120,464 is that which approaches most closely to the invention, the same 25 reference numerals are used in Figure 4 as those used in Figure 2b. As is the case in US 6,120,464, the HP feeder in the present invention can preferably be constructed without any bottom strainer, but it can also be the case that the HP feeder has a bottom strainer according to older systems. The HT feeder 53' is fed with a mixture of chips and fluid from a chip chute 52' where an L/W ratio of between 4-10:1 is established through an 30 active addition of fluid LIQ_A. It is appropriate that this fluid LIQ_A is constituted by a process fluid such as impregnation fluid or cooking fluid. This is particularly advantageous with the method according to the invention since the fluid that is added in

the chip chute 52' in order to establish a desired L/W-ratio accompanies the chips in the transfer line 6b' and, if it is desired, can also accompany the chips down into the treatment vessel 60'. It will be clear to one skilled in the arts that it is thereby possible to create under highly controlled conditions specific process conditions at an early stage 5 of the process, that is, as early as the feed phase. This contrasts with conventional feed systems in which large quantities of transport fluid are separated from the chips at the top of the treatment vessel as a consequence of the very high L/W ratios that are locally established in the transfer line. Thus, it is no longer necessary to withdraw any of the fluid from the chips at the top of the treatment vessel, something that means that the 10 expensive top separator (47 in Figure 1) and the return line (55 in Figure 2a) for the withdrawn transport fluid are no longer necessary. On the other hand, it is of course possible to withdraw a quantity of fluid if this is desirable from the point of view of the process, in order to achieve in this way an exchange of fluid for the chips mixture at the top separator. Further use of the process fluid withdrawn, if any, is described with 15 reference to Figure 5, but it is also valid for this embodiment.

A conventional HP feeder 53' follows the chip chute equipped with a rotor with 20 symmetrically placed through-pockets (1, 2) that during rotation are alternately placed in contact with the chip chute 52' and the transfer line 6b'. When one of the pockets of the rotor through rotation gradually opens towards the chip chute 52', it is filled with the fluid that in the previous position expelled the chips mixture into the circulation line 6b'. At the same time, the pocket facing the equivalent circulation line 54' opens, and 25 an open channel is created through the HP feeder. The pocket is in its first location when it is located in this filling position. Under the influence of one or more high-pressure pumps 57', 57'' or one pump with several pumping stages in the circulation line 54' together with the static pressure that is established by the column 52' of fluid in the chip chute, the fluid in pocket 1 will be sucked out/expelled while the chips mixture is fed into the pocket at the same time. Since there is no chute flow with forced flow of fluid as there was in earlier methods, the chips and the fluid move down through the 30 chip chute at the same speed. This means that the chips mixture is fed into the pocket 1 with a maintained L/W ratio, in contrast with earlier methods in which the forced flow of fluid carried chips with it into the pocket, causing in this manner a reduction in the

L/W ratio. A further reduction in L/W ratio is obtained with the earlier methods of operation at the emptying position when the chips are expelled into the transfer line 6b with the aid of the transport fluid returned from the top separator. This reduction in L/W ratio, when the pocket in its second position is located at the emptying position, 5 can be avoided with a method according to the present invention since it has been shown that expulsion of the chips does not require the addition of extra fluid in the circulation line 54'. Emptying of the pocket occurs according to the same principle as at the filling position in that a pocket 2 filled with chips mixture opens at the same time onto the transfer line 6b' and the high-pressure side of the circulation line 54' such that 10 an open channel is formed and fluid from the circulation line 54' can expel the chips mixture into the transfer line 6b'. Thus, it is possible both to fill and to empty the pockets in the HP feeder without either the chute flow or the transfer flow, and this is the principle aim of the invention.

15 It can occasionally be desirable from the point of view of the process to add a makeup fluid LIQ_B to the circulation line 54'. This makeup fluid LIQ_B is characterised in that it is not in any way a withdrawal from subsequent separation equipment connected to the treatment vessel 60'. Neither is the makeup fluid LIQ_B constituted in any way by a withdrawal from a strainer section at the upper part of a hydraulically filled treatment 20 vessel, which strainer section is to be equivalent to a top separator. It is characteristic for the addition of a makeup fluid LIQ_B that the amount that is added to the circulation line 54' results in a limited increase in the L/W ratio in the transfer line 6b' such that the added makeup fluid LIQ_B does not exceed 50%, preferably less than 40% and more preferably less than 30%, of the L/W ratio in the chip chute 52' and never in such an 25 amount that the L/W ratio in the transfer line 6b' exceeds 10:1. The makeup fluid LIQ_B can be constituted by white liquor, black liquor, green liquor, or it may contain chemicals that promote the process or increase the yield such as cellulose derivatives, for example CMC, organic sulphides such as carbon disulphide, mercaptides, etc., AQ derivatives or other substances.

feeder 53' located between two treatment vessels which can be constituted by a first impregnation vessel 3, essentially at atmospheric pressure, and a second, pressurised, digester 60'. The digester is symbolised in the figure by a steam-phase digester displaying two strainer sections for the withdrawal of cooking fluid, but it is to be understood that the method is not limited to this. The method can also be applied in association with continuous digesters of various types, both steam phase and hydraulic types, with modified cooking systems (MCC, EMCC, Lo-Solids) and with ITC, and it can be used when manufacturing cellulose pulp according to both the sulphite method and the sulphate method. In the same way, deciduous wood, conifer wood, annuals (such as bagasse, reed canary grass, etc.) can constitute the raw material for cellulose.

The term "impregnation vessel essentially at atmospheric pressure" is used here to denote an impregnation vessel in which the pressure at the top lies within the interval 1-3 bar (abs) and in which the inlet can be connected through some form of chip feed 2 directly to a chips pocket or other chips magazine 1 in an feed system. This impregnation vessel 3 can be designed such that the chips are first steamed during their downward passage through the vessel at an upper section Z1 and are subsequently impregnated in impregnation fluid in a lower section Z2 of the impregnation vessel in order to be subsequently fed onwards through the HP feeder 53' to the digester 60'. Depending on such factors as the L/W ratio present at the bottom of the impregnation vessel 3 and the static pressure from the superior column of fluid, no special equipment is needed other than, possibly, an output scraper (not shown in the drawing) at the bottom of the impregnation vessel 3 in order to expel the chips. Just as in previous embodiments according to Figure 4, in which the HP feeder 53' is preceded by a chip chute 52', an L/W ratio in the range 5-10:1 is appropriate in order to achieve secure filling and emptying of the HP feeder, and chips promotion between the two vessels (3, 60') takes place in all respects in the same manner as in the embodiment described in Figure 4 through the application of the method according to the characteristic section of claim 1.

Separation equipment 47' is shown in the drawing at the top of the digester, in which equipment a part of the process fluid in the chips mixture can be withdrawn if this is desirable from the point of view of the process. This withdrawn fluid is made visible by

the line LIQ_C . According to the innovative concept, this withdrawn process fluid LIQ_C is not returned to the HP feeder as a transport fluid, but there are otherwise no limitations on the use of this fluid. Depending on the cooking method, it can be led back to the input or to the impregnation vessel or in other cases it can be led forwards in 5 the system and added as a cooking fluid in the lower zones of the digester. In cases in which impregnation with black liquor is applied, the withdrawn process fluid LIQ_C can be partially or fully led away for the recycling of its chemicals.

A certain amount of compression of the chips is obtained as a consequence of the high 10 static pressure that is present at the bottom of the impregnation vessel 3. This compression is not obtained in a chip chute. One measure of the concentration of chips that is present at a certain position is constituted by the degree of filling that is present. A degree of filling of 100% corresponds to the concentration of chips that is obtained when a container is filled with non-deformed pieces of chip without any forced 15 packing, where fluid is subsequently added to the container such that the fluid fills the spaces that are present between the pieces of chip, while the pieces of chip retain the contact with each other in the same manner as if no fluid were present in the container. The degree of filling for stable feed of chips in a chip chute normally lies at approximately 50-85%, while degrees of filling have been measured at the bottom of 20 the impregnation vessel under stable conditions of operation of up to 110% due to the increased degree of packing that is obtained there. This means that an increased capacity of the HP feeder that is directly proportional to the degree of filling is obtained.

25 **ALTERNATIVE EMBODIMENTS**

With the HP feeder located after a chip chute, it has been traditional to arrange the HP feeder such that filling of the same takes place from above when a pocket in its first position has a vertical axis of symmetry. However, the method according to the invention is not limited to this manner of filling the HP feeder, and filling can also take 30 place when the axis of symmetry of the pocket is in a horizontal position. This may be particularly appropriate when the HP feeder is arranged subsequent to an impregnation vessel. Since impregnation vessels are normally placed on the ground, due to their size,

it is not obvious that there is sufficient space available for filling of the HP feeder from above. If the impregnation vessel is provided with a bottom scraper, the motor of this scraper will be located centrally under the bottom of the impregnation vessel, which probably results in it becoming necessary to place the HP feeder to one side of the 5 vertical axis of symmetry of the impregnation vessel, and thus it is no longer obvious that the best manner of filling the HP feeder is from above. Horizontal filling may be appropriate in this case, while it may also be relevant to consider filling from below.

The method may also be applied in a feed system according to the variation shown in 10 Figure 6. Reference numerals in this drawing are the same as those in Figure 4 to the extent that the same equipment is denoted. The principle of force-feeding of the HP feeder 53' is applied in this feed system with the aid of a pump 59 or other type of force-feed such as, for example, a screw. Supply of chips to this pump can take place from a chip chute 58 with horizontal output of chips, but supply of chips to this pump 15 59 can also take place from an impregnation vessel according to the embodiment that is described in Figure 5.

When the chips mixture is fed via the HP feeder and the transfer line to the top of the digester, it may be desirable to exchange process fluid at the top of the digester. 20 However, it should be pointed out that the method according to the invention does not require the exchange of process fluid at this position. The process fluid that is separated from the chips in the top separator can be returned to another position in the process and, depending on how the process is designed, the process fluid can be used in both preceding and in subsequent sections of the process. If the fluid withdrawn from the top 25 separator is impregnation fluid, it may be appropriate to return this fluid to the impregnation vessel. It is also the case that the impregnation fluid is, in general, rich in hemicellulose, and thus it may be desirable to seek to reprecipitate this hemicellulose onto the cellulose fibres in the digester, which means that the impregnation fluid can instead be added at the final phase of the cooking stage. A combination of the two 30 positions at which it is added can also be envisaged. Further, it will be clear to one skilled in the arts that the method according to the invention is not limited to these manners of using the withdrawn process fluid, and that the use of this fluid does not

constitute any characteristic of the innovative concept in any way other than that it is not to be returned to the HP feeder in order to be used as transport fluid in the transfer line.

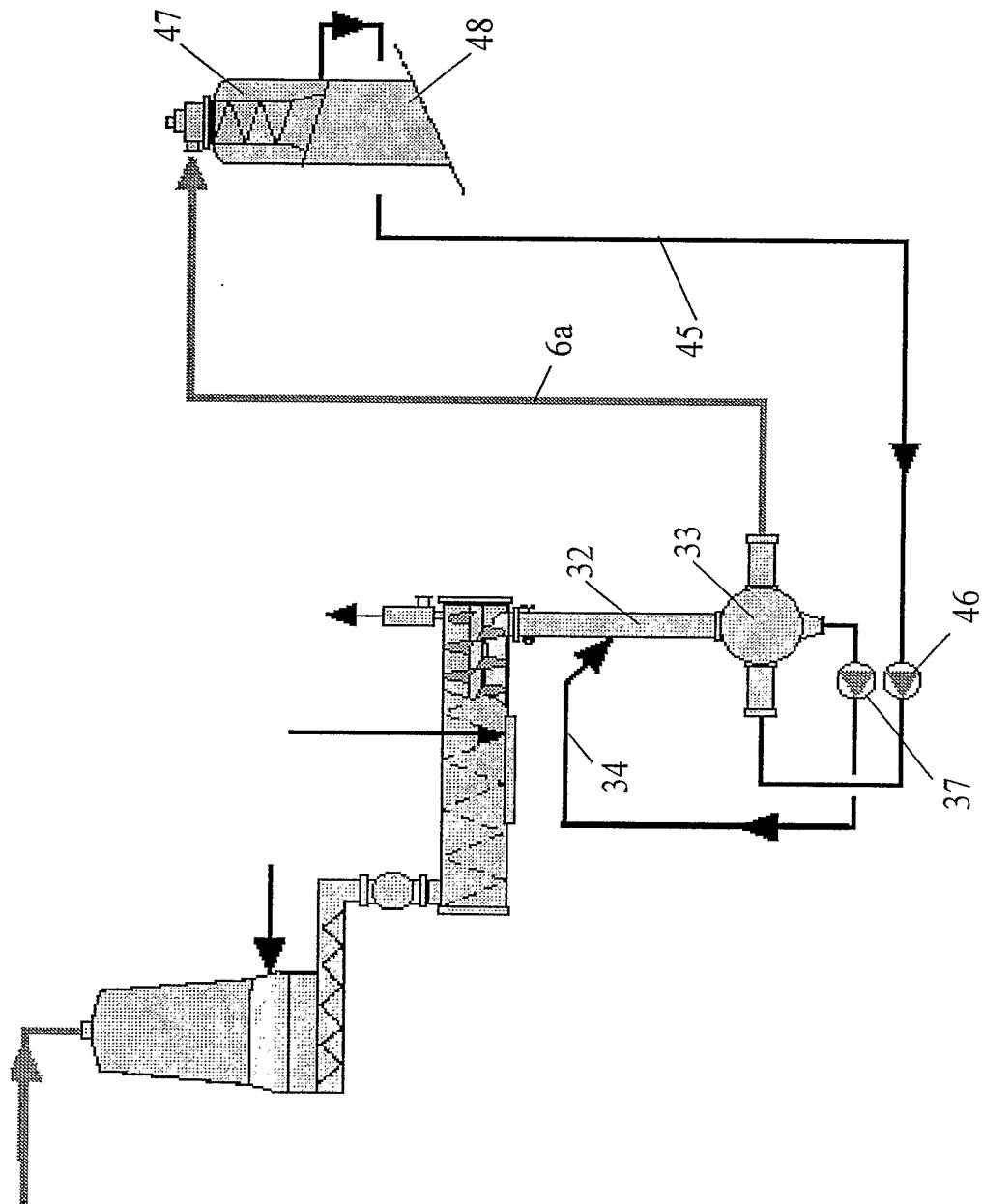
- 5 Thus the method can be applied in all types of digester system such as single-vessel and double-vessel digester systems of both steam phase and hydraulic types; digester systems with black liquor impregnation (BLI); modified digester systems (MCC, EMCC, Lo-Solids), and ITC; and it can be used during the manufacture of cellulose pulp according to both the sulphite method and the sulphate method. In the same way,
- 10 deciduous wood, conifer wood, annuals (such as bagasse, reed canary grass, etc.) can constitute the raw material for cellulose.

CLAIMS

1. A method for feeding a slurry of cellulose chips and fluid from a low-pressure system to a high-pressure system during the continuous cooking of chemical cellulose pulp where the feed between these systems takes place through the arrangement of a sluice feeder (53') between these two systems for the transport through the sluice of fluid and cellulose chips, and where the sluice feeder (53') is provided with a first inlet (53a'), a second inlet (53c'), a first outlet (53b') and a second outlet (53d') and comprises a rotor with through-pockets (1, 2) that are alternately placed into connection with the high-pressure system and the low-pressure system where the one pocket (1) that is located in a first position is in contact with a chip chute (52') or with an impregnation vessel (3) essentially at atmospheric pressure in the low-pressure system via the first inlet (53a') while the pocket (1) is filled with the chips mixture while at the same time expulsion of the fluid that is present in the pocket (1) takes place via the first outlet (53b') and where the second pocket (2), which is in a second position, is in connection with a transfer line (6b') in the high-pressure system via the second outlet (53d') while the chips mixture is expelled from the pocket (2) for transport onwards to a treatment vessel (60') in the high-pressure system with the aid of a fluid that is fed into the pocket (2) via the second inlet (53c'), and in that a recirculation line (54') comprising a high-pressure pump (57') extends from the first outlet (53b') of the sluice feeder to the second inlet (53c') of the sluice feeder for transport of the fluid that has been expelled from the pockets of the sluice feeder when these are located in their first position, *characterised* in that the fluid that expels the chips mixture from the pockets of the sluice feeder when these are located in their second position is essentially exclusively constituted by that fluid that has been expelled from the pockets of the sluice feeder when these are located in their first position.
2. The method according to claim (1) where the treatment vessel (60') comprises separation equipment (47') in connection with the transfer line (6b') *characterised* in that the fluid that expels the chips mixture from the pockets of the sluice feeder when these are located in their second position is not to any extent constituted by a return fluid (LIQ_C) from this separation equipment (47').

3. The method according to claim 1 or 2 characterised in that the fluid/wood ratio in the transfer line (6b') is essentially the same as the fluid/wood ratio in the chip chute (52') or in the impregnation vessel (3).
5
4. The method according to claim 1 or 2 characterised in that makeup fluid (LIQ_B) is added to the flow of fluid that has been expelled from the pockets (1, 2) of the sluice feeder when these are located in their first position.
- 10 5. The method according to claim 4 characterised in that the amount of makeup fluid (LIQ_B) that is added is equivalent to a maximum of 50%, preferably 40% and more preferably 30%, of the amount of fluid that is expelled from the pockets of the sluice feeder in their first position.
- 15 6. The method according to claim 2 characterised in that the fluid (LIQ_C) withdrawn from the separation equipment (47') is led to the chip chute (52') or the impregnation vessel (3) in such an amount that a fluid/wood ratio of between 4-10:1 is obtained in this chip chute (52') or impregnation vessel (3).
- 20 7. The method according to claim 1 characterised in that the high-pressure system lacks separation equipment (47') at the top of the treatment vessel (60') for separation of fluid from the chips mixture.
- 25 8. The method according to claim 7 characterised in that the system lacks a return line in the transfer flow (6b') for the return of withdrawn transport fluid (LIQ_C) to the sluice feeder (53').
- 30 9. The method according to any one of the preceding claims characterised in that the fluid/wood ratio in the chip chute (52'), the impregnation vessel (3) and the transfer line (6b') does not exceed a value of 10:1.

FIGUR 1



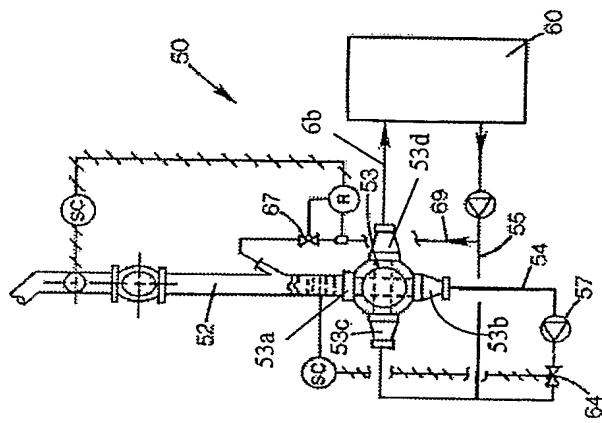


Figure 2b

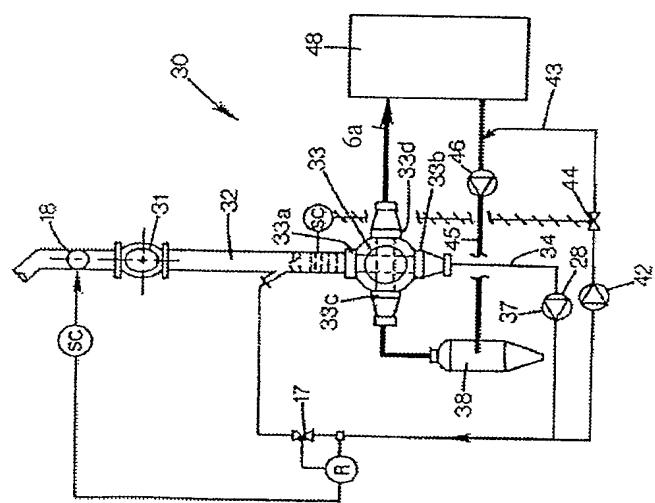


Figure 2a

FIGUR 3

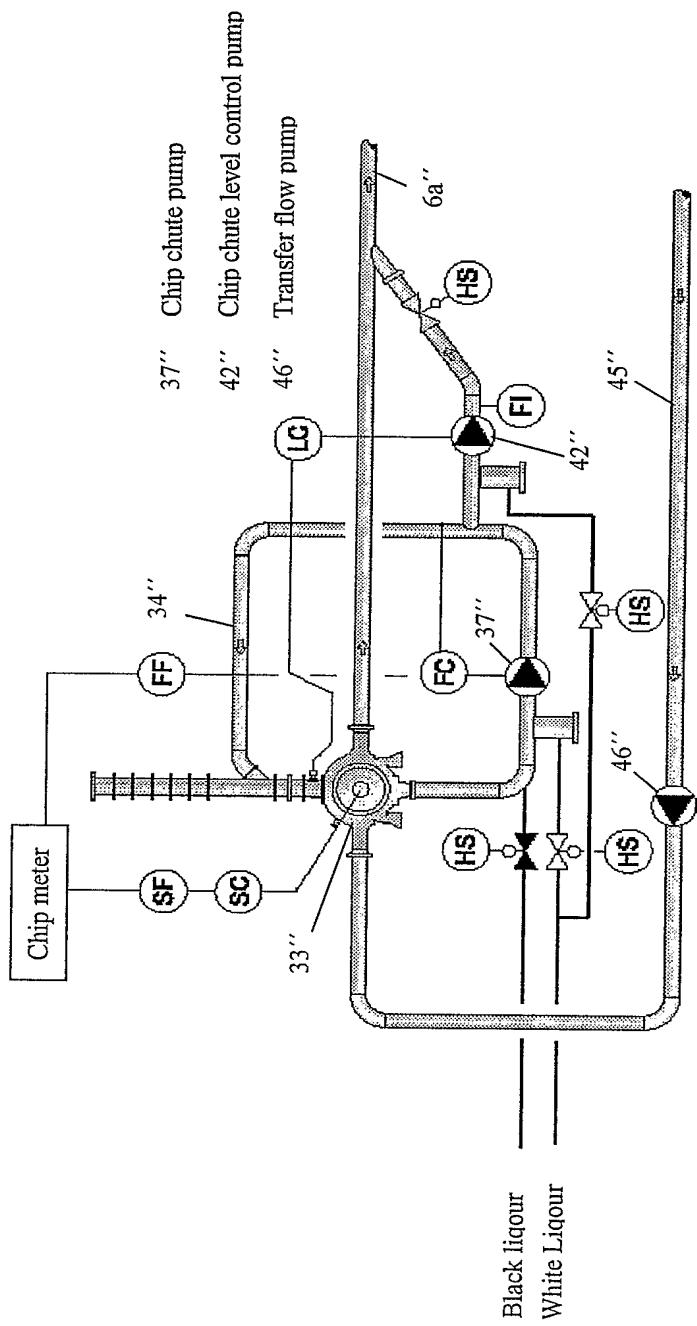
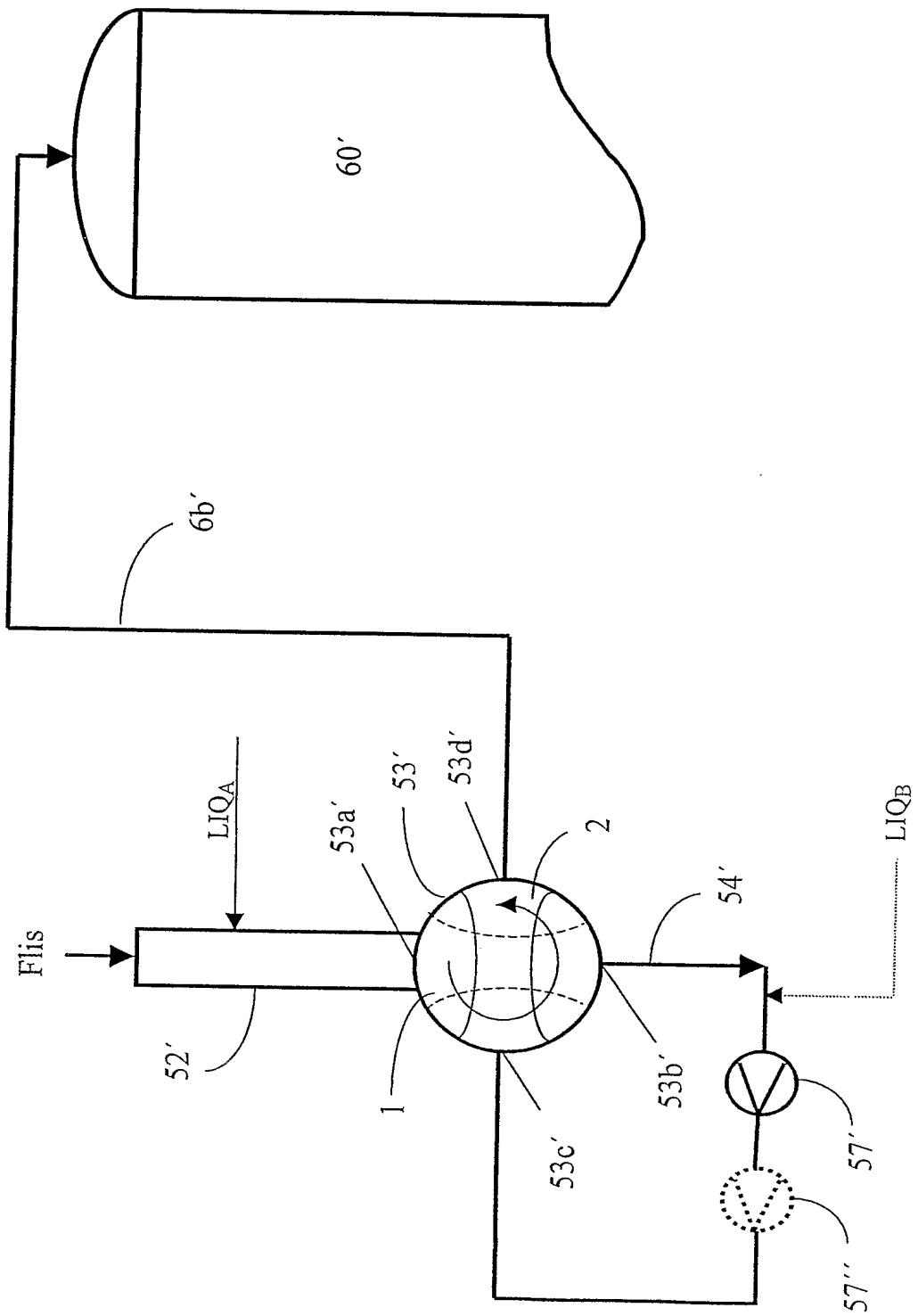


FIG. 4



FIGUR 5

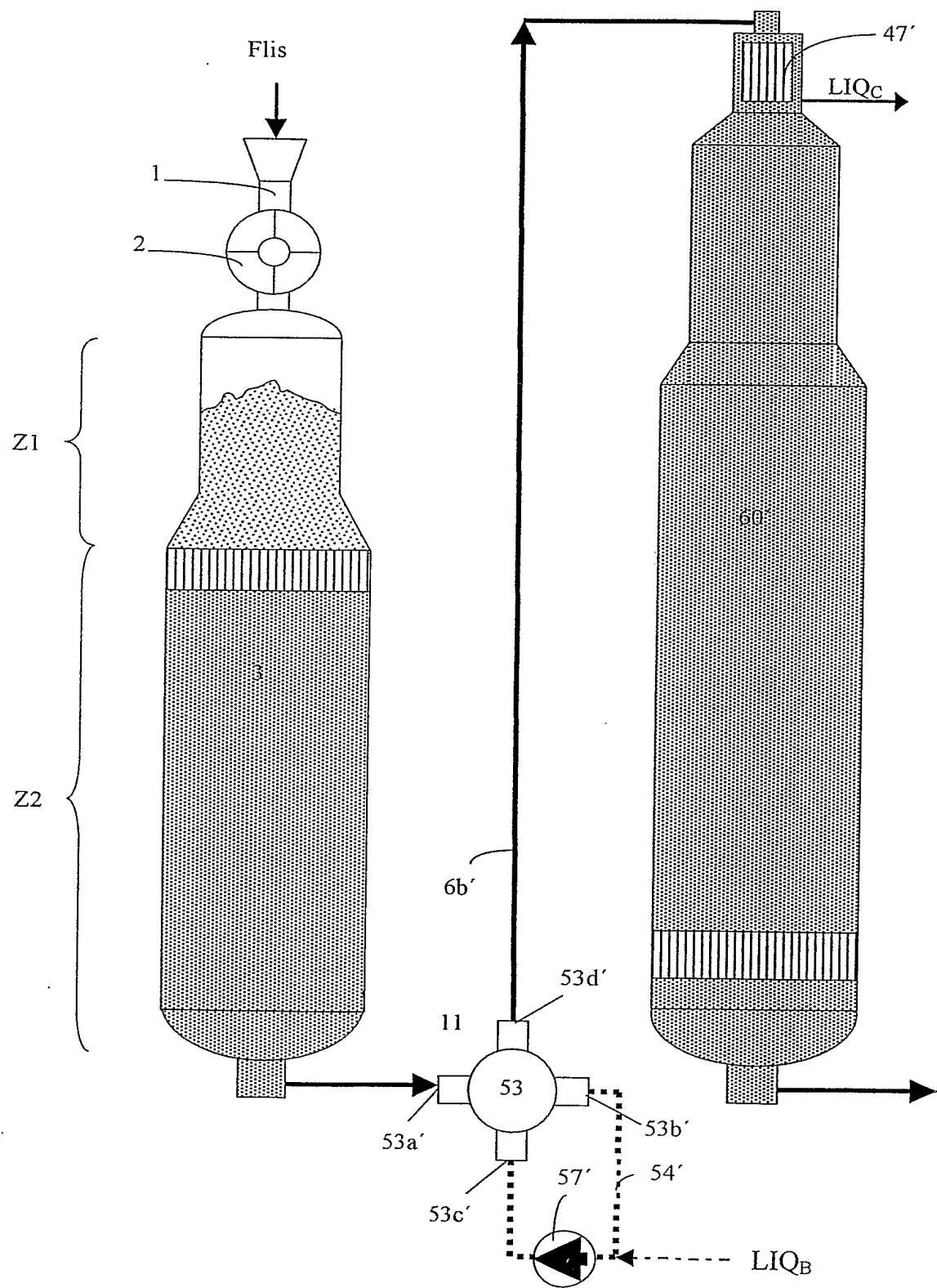
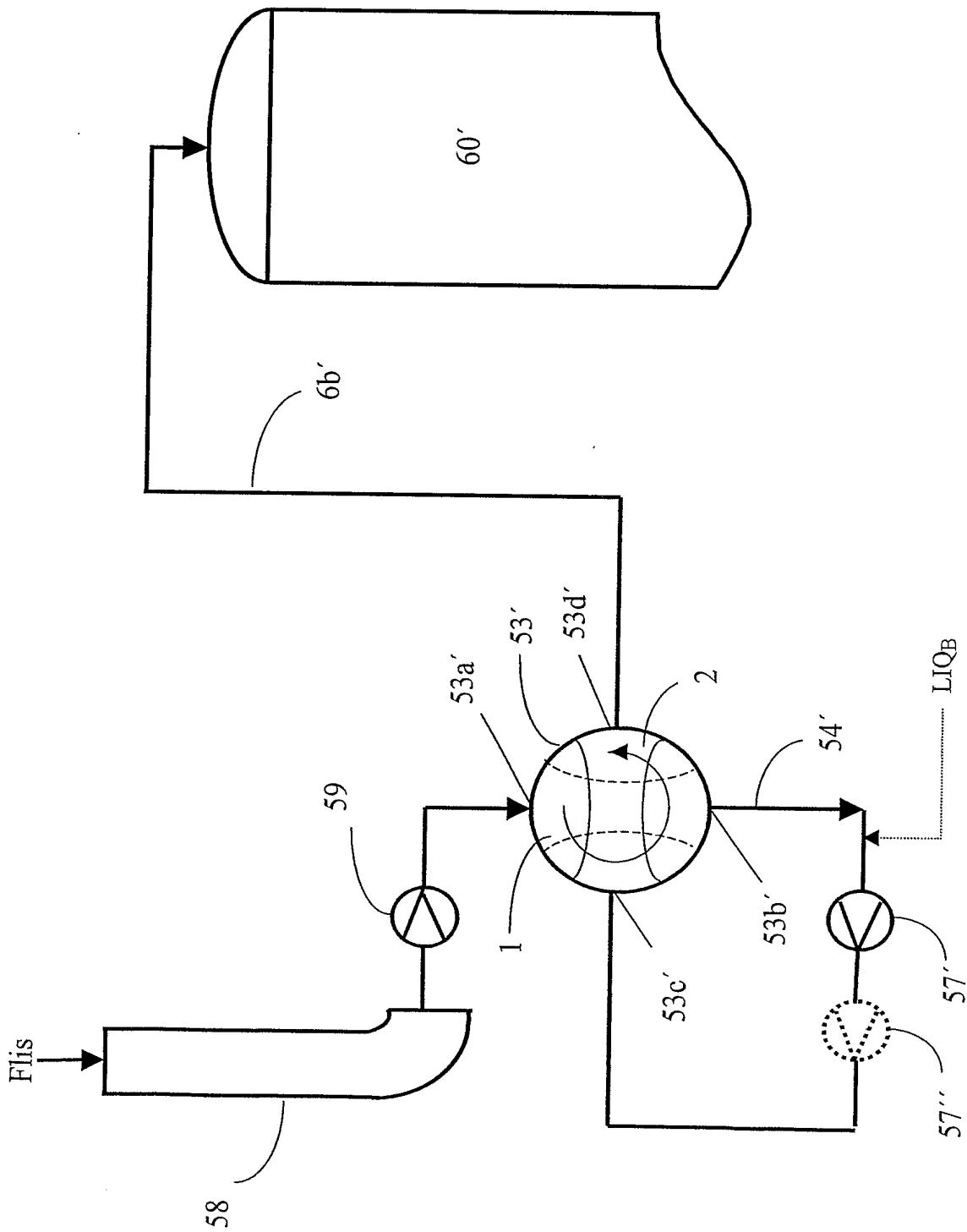


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/00407

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21C 7/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9942653 A1 (KVAERNER PULPING AB), 26 August 1999 (26.08.99), figure 3 --	1-9
A	US 4284120 A (STIG GLÖERSEN), 18 August 1981 (18.08.81), figures 4a,4b,5 --	1-9
A	US 4954219 A (STIG GLÖERSEN), 4 Sept 1990 (04.09.90), figure 1 -----	1-9

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

2 June 2003

06-06-2003

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INTERNATIONAL SEARCH REPORT

Information on patent family members

29/04/03

International application No.

PCT/SE 03/00407

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO 9942653 A1	26/08/99	AU	2650599 A	06/09/99
		AU	6529998 A	12/10/98
		BR	9907838 A	24/10/00
		CA	2317750 A	26/08/99
		EP	1056903 A	06/12/00
		JP	2002504631 T	12/02/02
		SE	9800476 D	00/00/00
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		FR	2363666 A,B	31/03/78
		SE	7609782 A	04/03/78
US 4954219 A	04/09/90	DE	2938828 T	11/12/80
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		JP	55500141 T	13/03/80
		SE	7802408 A	03/09/79
		WO	7900692 A	20/09/79

DERWENT-ACC-NO: 2003-539637

DERWENT-WEEK: 200615

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TITLE: Supply and mixing of chips and water for continuous cooking process using pressure sluice feeder, has same liquid discharged from pockets in their first and second positions

INVENTOR: GUSTAVSSON L; SNEKKENES V

PATENT-ASSIGNEE: GUSTAVSSON L[GUSTI] , KVAERNER PULPING AB[KVAEN] , KVAERNER PULPING TECHNOLOGIES AB[KVAEN] , SNEKKENES V[SNEKI]

PRIORITY-DATA: 2002SE-000790 (March 15, 2002)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
SE 200200790 A	February 4, 2003	SV
SE 519262 C2	February 4, 2003	SV
WO 03078727 A1	September 25, 2003	EN
AU 2003208689 A1	September 29, 2003	EN
EP 1488038 A1	December 22, 2004	EN
BR 200308310 A	December 28, 2004	PT
JP 2005520943 W	July 14, 2005	JA
US 20060037723 A1	February 23, 2006	EN

DESIGNATED-STATES: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NI NO NZ OM PH PL PT RO RU SC S D SE SG SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW AL AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GR HU IE IT LI LT LU LV MC M K NL PT RO SE SI SK TR

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL- DATE
SE 200200790A	N/A	2002SE-000790	March 15, 2002
AU2003208689A1	N/A	2003AU-208689	March 12, 2003
BR 200308310A	N/A	2003BR-008310	March 12, 2003
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EP 1488038A1	N/A	2003WO-SE00407	March 12, 2003

BR 200308310A	N/A	2003WO- SE00407	March 12, 2003
JP2005520943W	N/A	2003WO- SE00407	March 12, 2003
US20060037723A1	N/A	2003WO- SE00407	March 12, 2003
US20060037723A1	Based on	2004US- 504948	August 16, 2004

INT-CL-CURRENT:

TYPE	IPC DATE
CIPP	D21C3/24 20060101
CIPP	D21C7/06 20060101
CIPS	D21C7/06 20060101

ABSTRACTED-PUB-NO: SE 200200790 A

BASIC-ABSTRACT:

NOVELTY - The liquid from the chip mixture which is discharged from the pockets (1, 2) in a second position essentially comprises the liquid discharged from these pockets when they are in a first position.

DESCRIPTION - A method for supplying and mixing cellulose chips and water from a low pressure system to a high pressure system for a continuous chemical pulp cooking process comprises the use of a sluice feeder (53) located in between the two systems. The feeder has two inlets (53a, 53c), two outlets (53b, 53d) and a rotor with pockets (1, 2) extending through it, the pockets being in contact with the high and low pressure systems alternately. One pocket (1) in a first position is in communication with a chip bin (52) or essentially atmospheric pressure impregnation

vessel via a first inlet (53a) whilst the pocket is being filled with chips, and at the same time the liquid in this pocket is discharged via a first outlet (53b). The other pocket (2) in a second position is in communication with a transfer pipe (6b) in the high pressure system via a second outlet (53d) whilst the chip mixture is discharged from this pocket for transport to a treatment vessel (60) in the high pressure system with the aid of a liquid supplied to this pocket via a second inlet (53c). A recirculation pipe (54) with a high pressure pump (57) extends from the first outlet to the second inlet and is used to transport the liquid discharged from the pockets when they are in the first position. The liquid from the chip mixture which is discharged from the pockets in the second position essentially comprises the liquid discharged from these pockets when they are in the first position.

USE - For single or twin-vessel cooking systems of the vapour phase or hydraulic type, cooking systems with black liquor impregnation (BLI), modified cooking systems (e.g. MCC, EMCC or Lo-Solids) or ITC, and can be used for making both sulphite and sulphate pulps from hardwood, softwood or one-year old plants.

ADVANTAGE - The feeder can be filled and emptied without the need for powerful liquid circulation, using only a small amount of liquid.

DESCRIPTION OF DRAWING(S) - Figure 4 shows the feed system (drawing includes non-English language-text).

Rotor pockets (1, 2)

Transfer pipe (6b)

Chip bin (52)

High pressure feeder (53)

Feeder inlets (53a, 53c)

Feeder outlets (53b, 53d)

Circulation pipe (54)

High pressure pipes (57, 57)

Treatment vessel (60)

Make-up liquid (LIQB)

CHOSEN-DRAWING: Dwg.4/7

TITLE-TERMS: SUPPLY MIX CHIP WATER CONTINUOUS
COOK PROCESS PRESSURE SLUICE FEED
LIQUID DISCHARGE POCKET FIRST
SECOND POSITION

DERWENT-CLASS: F09

CPI-CODES: F05-A02A;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: 2003-146211